

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

#9458
10/10
RECEIVED
JUL 09 2002
TECH CENTER 1600/2900
1645

Applicants: Tillman U. Gerngross

Serial No.: 09/892,591

Art Unit: 1645

Filed: June 27, 2001

Examiner: Not Yet Assigned

For: *METHODS FOR PRODUCING MODIFIED GLYCOPROTEINS*

Assistant Commissioner for Patents
Washington, D.C. 20231

INFORMATION DISCLOSURE STATEMENT

Sir:

Pursuant to 37 C.F.R. §1.56 and 37 C.F.R. §1.97, Applicant submits an Information Disclosure Statement, including nine (9) pages of Form PTO-1449 and a copy of fifty-six (56) document cited therein. We were unable to locate copies of those references indicated with an asterisk (*). We will forward copies of these shortly.

This Information Disclosure Statement is being filed under 37 C.F.R. § 1.97(b) prior to a first Office Action on the merits. It is believed that no fee is required with this submission. However, should a fee be required, the Commissioner is hereby authorized to charge any required fees to Deposit Account No. 50-1868.

U.S. Patents

<u>Number</u>	<u>Issue Date</u>	<u>Patentee</u>	<u>Class/Subclass</u>
4,414,329	11-08-1983	Wegner	435/71.1
4,617,274	10-14-1986	Wegner	435/255.5
4,683,293	07-28-1987	Craig	530/359
4,775,622	10-04-1988	Hitzeman et al.	435/68
4,808,537	02-28-1989	Stroman et al.	435/6

U.S.S.N.: 09/892,591

Filed: June 27, 2001

INFORMATION DISCLOSURE STATEMENT

4,812,405	03-14-1989	Lair et al.	435/255
4,818,700	04-04-1989	Cregg et al.	435/252.33
4,837,148	06-06-1989	Cregg	435/172.3
4,855,231	08-08-1989	Stroman et al.	435/68
4,857,467	08-15-1989	Sreekrishna et al.	435/255
4,879,231	11-07-1989	Stroman et al.	435/172.3
4,882,279	11-21-1989	Cregg	435/172.3
4,885,242	12-05-1989	Cregg	435/68
4,925,796	05-15-1990	Bergh et al.	435/97
4,929,555	05-29-1990	Cregg et al.	435/172.3
4,935,349	06-19-1990	McKnight et al.	435/69.5
5,002,876	03-26-1991	Sreekrishna et al.	435/69.5
5,004,688	04-02-1991	Craig et al.	435/69.3
5,032,516	07-16-1991	Cregg	435/172.3
5,032,519	07-16-1991	Paulson et al.	435/193
5,047,335	09-10-1991	Paulson et al.	435/69.1
5,122,465	06-16-1992	Cregg et al.	435/172.3
5,135,854	08-04-1992	MacKay et al.	435/69.1
5,166,329	11-24-1992	Cregg	536/27
5,324,663	06-28-1994	Lowe	435/320.1
5,595,900	01-27-1997	Lowe	435/193
5,602,003	02-11-1997	Pierse et al.	435/69.1
5,707,828	01-13-1998	Sreekrishna et al.	435/69.1
5,766,910	06-16-1998	Fukuda et al.	435/193
5,834,251	11-10-1998	Maras et al.	435/71.1
5,849,904	12-15-1998	Gerardy-Schahn et al.	536/24.31
5,854,018	12-29-1998	Hitzemane et al.	435/69.1
5,861,293	01-19-1999	Kojiri et al.	435/193
5,910,570	06-08-1999	Elhammer et al.	530/328
5,945,314	08-31-1999	Prieto et al.	435/101
5,945,322	08-31-1999	Gotschlich	435/193
5,955,347	09-21-1999	Lowe	435/252.3
5,955,422	09-21-1999	Lin	514/8
5,962,294	10-05-1999	Paulson et al.	435/193
6,017,743	01-25-2000	Tsuji et al.	435/193
6,096,512	08-01-2000	Elhammer et al.	435/68.1
6,204,431	03-20-2001	Prieto et al.	800/14

Foreign Documents

<u>Number</u>	<u>Publication Date</u>	<u>Patentee</u>	<u>Country</u>
0 905 232 A1	03-31-1999	Kirin Beer Kabushiki Kaisha	EP
1 054 062 A1	11-22-2000	Kyowa Hakko Kogyo	EP

		Co., Ltd.	
WO 96/21038	07-11-1996	Alko Group Ltd	PCT
WO 98/05768	02-12-1998	The Austin Research Institute	PCT
WO 99/31224	06-24-1999	National Research Council of Canada	PCT
WO 99/54342	10-28-1999	Umana et al.	PCT
WO 01/14522 A1	03-01-2001	Kirin Beer Kabushiki Kaisha	PCT
WO 01/25406	04-12-2001	University of Victoria Innovation & Development Corporation	PCT
WO 02/00856	01-01-2002	Flanders Interuniversity Institute for Biotechnology	PCT

Publications

*ALTMANN, et al., "Processing of asparagine-linked oligosaccharides in insect cells: evidence for alpha-mannosidase II," *Glycoconj. J* 12(2):150-155 (1995).

*ALTMANN, et al., "Insect cells as hosts for the expression of recombinant glycoproteins," *Glycoconj. J.* 16(2):109-123 (1999).

*ANDERSEN, et al., "The effect of cell-culture conditions on the oligosaccharide structures of secreted glycoproteins," *Cur. Opin. Biotechnol* 5(5) 546-549 (1994).

*AOKI, et al., "Expression and activity of chimeric molecules between human UDP-galactose transporter and CMP-sialic acid transporter," *J Biochem (Tokyo)* 126(5): 940-950 (1999).

*BARDOR, et al., "Analysis of the N-glycosylation of recombinant glycoproteins produced in transgenic plants," *Trends in Plant Science* 4(9): 376-380 (1999).

*BEAUDET, et al., "High-level expression of mouse Mdr3 P-glycoprotein in yeast *Pichia pastoris* and characterization of ATPase activity," *Methods Enzymol* 292: 397-413 (1998).

*BERKA, et al., "The Filamentous Fungus *Aspergillus-Niger* Var *Awamori* as Host for the Expression and Secretion of Fungal and Non-Fungal Heterologous Proteins," *Abstr Papers Amer Chem Soc* 203: 121-BIOT (1992).

BERNINSONE, et al., "Functional expression of the murine Golgi CMP-sialic acid transporter in *saccharomyces cerevisiae*," *J. Biol. Chem.* 272(19):12616-12619 (1997).

BERNINSONE, et al., "Regulation of yeast Golgi glycosylation. Guanosine diphosphatase functions as a homodimer in the membrane," *J. Biol. Chem* 270(24): 14564-14567 (1995).

*BERNINSONE, et al., "The Golgi guanosine diphosphatase is required for transport of GDP-mannose into the lumen of *Saccharomyces cerevisiae* Golgi vesicles," *J. Biol. Chem* 269(1):207-211 (1994).

*BONNEAUD, et al., "A family of low and high copy replicative, integrative and single-stranded *S. cerevisiae*/E. coli shuttle vectors," *Yeast* 7(6): 609-615 (1991).

*BRETTHAUER, et al., "Glycosylation of *Pichia pastoris*-derived proteins," *Biotechnol Appl Biochem* 30(Pt 3): 193-200 (1999).

*CEREGHINO, et al., "Heterologous protein expression in the methylotrophic yeast *Pichia pastoris*," *FEMS Microbiol Rev* 24(1): 45-66 (2000).

*CHANDRASEKARAN, et al., "Purification and properties of alpha-D-mannose:beta-1,2-N-acetylglucosaminyl-transferases and alpha-D-mannosidases from human adenocarcinoma," *Cancer Res.* 44(9):4059-68 (1984).

CHIBA, et al., "Production of human compatible high mannose-type (Man5GlcNAc2) sugar chains in *Saccharomyces cerevisiae*," *J. Biol. Chem* 273(41): 26298-26304 (1998).

*COLE, et al., "Modelling the growth, survival and death of microorganisms in foods: the UK food micromodel approach," *J Cell.Biochem* 23(3-4) 265-265 (1994).

*DENTE, "Human alpha-1-acid glycoprotein genes," *Prog. Clin. Biol. Res* 300:85-98 (1989).

*EADES, et al., "Characterization of the class I alpha-mannosidase gene family in the filamentous fungus *Aspergillus nidulans*," *Gene* 255(1):25-34 (2000).

*ECKHARDT, et al., "Molecular cloning of the hamster CMP-sialic acid transporter," *Eur. J. Biochem.* 248(1): 187-192 (1997).

*GRAHAM, et al., "Compartmental organization of Golgi-specific protein modification and vacuolar protein sorting events defined in a yeast sec18 (NSF) mutant," *J. Cell. Biol.* 114(2):207-218 (1991).

GUILLEN, et al., "Mammalian Golgi apparatus UDP-N-acetylglucosamine transporter: molecular cloning by phenotypic correction of a yeast mutant," *Proc. Natl.Acad. Sci.USA* 95(14): 7888-7892 (1998).

*HARKKI, et al., "A Novel Fungal Expression System - Secretion of Active Calf Chymosin from the Filamentous Fungus *Trichoderma-Reesei*." *Bio-Tech* 7:596-603 (1989).

*ICHISHIMA, et al., "Molecular and enzymic properties of recombinant 1, 2-alpha-mannosidase from *Aspergillus saitoi* overexpressed in *Aspergillus oryzae* cells," *Biochem. J.* 339(Pt 3):589-597 (1999).

*ISHIDA, et al., "Molecular cloning and functional expression of the human Golgi UDP-N-acetylglucosamine transporter," *J. Biochem. (Tokyo)* 126(1): 68-77 (1999).

*JARVIS, et al., "Engineering N-glycosylation pathways in the baculovirus-insect cell system," *Curr Opin Biotechnol* 9(5):528-33 (1998).

*KAINUMA, et al., "Coexpression of alpha1,2 galactosyltransferase and UDP-galactose transporter efficiently galactosylates N- and O-glycans in *Saccharomyces cerevisiae*," *Glycobiology* 9(2): 133-141 (1999).

*KALSNER, et al., "Insertion into *Aspergillus nidulans* of functional UDP-GlcNAc: alpha 3-D- mannoside beta-1,2-N-acetylglucosaminyl-transferase I, the enzyme catalysing the first committed step from oligomannose to hybrid and complex N-glycans," *Glycoconj. J.* 12(3):360-370 (1995).

*KHATRA, et al., "Some kinetic properties of human milk galactosyltransferase," *Eur. J. Biochem.* 44:537-560 (1974).

*KREZDORN, et al., "HUMAN BETA-1,4 GALACTOSYLTRANSFERASE AND ALPHA-2,6 SIALYLTRANSFERASE EXPRESSED IN *SACCHAROMYCES-CEREVISIAE* ARE RETAINED AS ACTIVE ENZYMES IN THE ENDOPLASMIC-RETICULUMEUR," *J BIOCHEM* 220(3): 809-817 (1994).

*MALISSARD, et al., "Expression of functional soluble forms of human beta-1, 4-galactosyltransferase I, alpha-2,6-sialyltransferase, and alpha-1, 3-fucosyltransferase VI in the methylotrophic yeast *Pichia pastoris*," *Biochem Biophys Res Commun* 267(1): 169-173 (2000).

*MARAS, et al., "In vitro conversion of the carbohydrate moiety of fungal glycoproteins to mammalian-type oligosaccharides - Evidence for N-acetylglucosaminyltransferase-I-accepting glycans from *Trichoderma reesei*," *European Journal of Biochemistry* 249(3): 701-707 (1997).

*MARAS, et al., "Molecular cloning and enzymatic characterization of a *Trichoderma reesei* 1,2-alpha-D-mannosidase," *J. Biotechnol.* 77(2-3):255-263 (2000).

*MARTINET, et al., "Modification of the protein glycosylation pathway in the methylotrophic yeast *Pichia pastoris*," *Biotechnology Letters* 20(12): 1171-1177 (1998).

*MARUYAMA, et al., "A 1,2-alpha-D-mannosidase from a *Bacillus* sp.: purification, characterization, and mode of action," *Carbohydrate Res.* 251:89-98 (1994).

*MCGARVEY, et al., "Expression of the rabies virus glycoprotein in transgenic tomatoes," *Bio-Technology* 13(13): 1484-1487 (1995).

*MOENS, et al., "Glycoproteins in prokaryotes," *Arch. Microbiol* 168(3):169-175 (1997).

*NAKANISHI-SHINDO, et al., "Structure of the N-linked oligosaccharides that show the complete loss of alpha-1,6-polymannose outer chain from och1, och1 mnn1, and och1 mnn1 alg3 mutants of *Saccharomyces cerevisiae*," *J. Biol. Chem.* 268(35): 26338-26345 (1993).

*PEREZ, et al., "Transport of sugar nucleotides into the lumen of vesicles derived from rat liver rough endoplasmic reticulum and Golgi apparatus," *Methods Enzymol* 138: 709-715 (1987).

PUGLIELLI, et al., "Reconstitution, identification, and purification of the rat liver golgi membrane GDP-fucose transporter," *J. Biol. Chem.* 274(50):35596-35600 (1999).

*RAJU et al., "Analysis of glycoconjugates," *Anal Biochem.* 283(2): 123-124 (2000).

*REN et al., "Purification and properties of a Golgi-derived (alpha 1,2)-mannosidase-I from baculovirus-infected lepidopteran insect cells (IPLB-SF21AE) with preferential activity toward mannose6-N-acetylglucosamine2," *Biochem.* 34(8): 2489-2495 (1995).

*ROMERO, et al., "Ktr1p is an alpha-1,2-mannosyltransferase of *Saccharomyces cerevisiae*. Comparison of the enzymic properties of soluble recombinant Ktr1p and Kre2p/Mnt1p produced in *Pichia pastoris*." *Biochem. J.* 321(Pt 2): 289-295 (1997).

*RUTHER et al., "c-fos expression interferes with thymus development in transgenic mice," *Cell* 53(6): 847-856; (1988).

*Schachter et al., "The 'yellow brick road' to branched complex N-glycans," *Glycobiology* 1(5): 453-461 (1991).

*SCHNEIKERT et al., "Characterization of a novel mouse recombinant processing alpha-mannosidase," *Glycobiology* 4(4): 445-450 (1994).

*SCHWIENTEK et al., "Golgi localization in yeast is mediated by the membrane anchor region of rat liver sialyltransferase," *J Biol Chem* 270(10): 5483-5489 (1995).

*SEGAWA, et al. "Schizosaccharomyces pombe UDP-galactose transporter: identification of its functional form through cDNA cloning and expression in mammalian cells," *FEBS Lett* 451(3): 295-298 (1999).

*SIKORSKI, et al., "A system of shuttle vectors and yeast host strains designed for efficient manipulation of DNA in *Saccharomyces cerevisiae*," *Genetics*; 122(1): 19-27 (1989).

*SOMMERS, et al., "Transport of Sugar Nucleotides into Rat-Liver Golgi." *J. Cell Biol.* 91(2): A406-A406 (1981).

*SOMMERS, et al., "Transport of sugar nucleotides into rat liver Golgi. A new Golgi marker activity," *J. Biol. Chem.*; 257(18): 811-817 (1982).

*STAUB, et al., "High-yield production of a human therapeutic protein in tobacco chloroplasts," *Nature Biotechnology* 18(3): 333-338 (2000).

*SVETINA, et al., "Expression of catalytic subunit of bovine enterokinase in the filamentous fungus *Aspergillus niger*," *J. Biotechnol* 76(2-3): 245-251 (2000).

*TAKEUCHI, "Trial for molecular breeding of yeast for the production of glycoprotein therapeutics," *Trends in Glycoscience and Glycotechnology* 9:S29-S35 (1997).

*WARE, et al., "Expression of Human Platelet Glycoprotein Ib-Alpha in Transgenic Mice," *Thrombosis and Haemostasis* 69(6): 1194-1194 (1993).

*WEIKERT, et al., "Engineering Chinese hamster ovary cells to maximize sialic acid content of recombinant glycoproteins," *Nat Biotech* 17(11): 1116-1121 (1999).

*WERNER, et al., "Appropriate mammalian expression systems for biopharmaceuticals," *Arzneimittelforschung* 48(8):870-880 (1998).

*YANG, et al., "Effects of ammonia on CHO cell growth, erythropoietin production, and glycosylation," *Biotechnol Bioengin* 68(4): 370-380 (2000).

*YOKO-O, et al., "Schizosaccharomyces pombe och1(+) encodes alpha-1,6-mannosyltransferase that is involved in outer chain elongation of N-linked oligosaccharides," *FEBS Lett.* 489(1):75-80 (2001).

*YOSHIDA, et al., "1,2-alpha-D-mannosidase from *Penicillium citrinum*: molecular and enzymic properties of two isoenzymes," *Biochem. J.* 290(Pt 2):349-354 (1993).

*YOSHIDA, et al., "Expression and characterization of rat UDP-N-acetylglucosamine: alpha-3-D-mannoside beta-1,2-N-acetylglucosaminyltransferase I in *Saccharomyces cerevisiae*," *Glycobiology* 9(1): 53-58 (1999).

Remarks

This statement should not be interpreted as a representation that an exhaustive search has been conducted or that no better art exists. Moreover, Applicant invites the Examiner to make an independent evaluation of the cited art to determine its relevance to the subject matter of the present application. Applicant is of the opinion that his claims patentably distinguish over the art referred to herein, either alone or in combination.

Respectfully submitted,



Patrea L. Pabst
Reg. No. 31,284

Dated: July 1, 2002

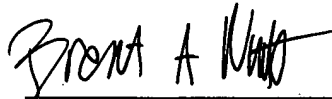
HOLLAND & KNIGHT LLP
One Atlantic Center
1201 West Peachtree Street, N.E.
Suite 2000
Atlanta, Georgia 30309-3400
404-817-8473
FAX 404-817-8588
www.hklaw.com

U.S.S.N.: 09/892,591
Filed: June 27, 2001
INFORMATION DISCLOSURE STATEMENT

Certificate of Mailing under 37 C.F.R. § 1.8(a)

I hereby certify that this Information Disclosure Statement, along with any paper referred to as being attached or enclosed, is being deposited with the United States Postal Service on the date shown below with sufficient postage as first-class mail in an envelope addressed to the Assistant Commissioner for Patents, Washington, D.C. 20231.

Date: July 1, 2002



Brent A. Winitt

ATL1 #531902 v1